Claims

1. (Currently Amended) A method for making a structure, at least a portion of which is intermetallic, the method comprising:

machining at least one machinable intermetallic lamina to form a machined intermetallic lamina, the machinable intermetallic lamina comprising nickel aluminide, iron aluminide or titanium aluminide;

adding at least one bonding lamina or layer to the registered stack to facilitate bonding between the intermetallic lamina and a second lamina adjacent the intermetallic lamina;

stacking and registering the machined intermetallic lamina with at least one ~~other~~ lamina other than the bonding lamina selected from patterned lamina, non-patterned lamina and combinations thereof, thereby forming a registered stack; and

processing the registered stack to make an intermetallic structure.

Claim 2 (Canceled).

3. (Currently amended) The method according to claim [[2]] 1 where the nickel aluminide is NiAl.

4. (Currently amended) The method according to claim [[2]] 1 where the nickel aluminide is Ni_3Al.

Claim 5 (Canceled).

6. (Currently amended) The method according to claim [[5]] 1 where the iron aluminide is FeAl.

7. (Currently amended) The method according to claim [[5]] 1 where the iron aluminide is Fe_3Al.

Claim 8 (Canceled).

9. (Currently amended) The method according to claim [[8]] 1 where the titanium aluminide is TiAl.

10. (Currently Amended) The method according to claim [[8]] 1 where the titanium aluminide is Ti_3Al.

11. (Currently amended) The method according to claim 1 ~~further comprising adding at least one~~ where the bonding lamina or layer ~~to the registered stack to facilitate bonding~~ is positioned between a first intermetallic lamina and a second intermetallic lamina.

12. (Original) The method according to claim 11 where the bonding lamina is substantially pure nickel.

13. (Original) The method according to claim 12 where the bonding lamina has a thickness of from about 5 to about 10 microns.

14. (Previously Presented) The method according to claim 1 where machining comprises lithography, laser ablation, an electrochemical machining process, chemical etching, plasma etching, mechanical cutting, a hydraulic process, solid abrasion, particle beam, ultrasonic machining, electromagnetic machining, wire and ram electrodischarge (EDM), waterjet, abrasive waterjet, precision plasma cutting, or combinations thereof.

15. (Previously Presented) The method according to claim 1 comprising procuring a patterned lamina or lamina blank.

16. (Original) The method according to claim 1 further comprising providing at least a second lamina in addition to the at least one machinable intermetallic lamina, the second lamina comprising at least a first metal layer and a second metal layer.

17. (Previously Presented) The method according to claim 16 where each of the first and second metal layers comprises a substantially pure metal prior to heat treatment.

18. (Original) The method according to claim 17 where the second lamina comprises three metal layers.

19. (Original) The method according to claim 18 where one of the layers comprises an element different from the other two layers.

20. (Previously Presented) The method according to claim 19 where one of the layers is substantially pure iron, nickel, titanium or aluminum.

21. (Original) The method according to claim 18 wherein two of the layers are substantially pure aluminum, and one layer is substantially pure nickel.

22. (Original) The method according to claim 18 where two of the layers are substantially pure aluminum, and one layer is substantially pure titanium.

23. (Previously Presented) The method according to claim 1 further comprising applying an adhesive between two or more laminae.

24. (Original) The method according to claim 17 where processing comprises vacuum heating at a temperature and for a length of time sufficient to form an intermetallic.

25. (Original) The method according to claim 16 where processing further comprises liquid-phase bonding.

26. (Original) The method according to claim 16 where processing further comprises diffusion bonding.

27. (Original) The method according to claim 1 wherein the intermetallic structure includes one or more catalysts operatively associated therewith.

Claims 28-30 (Canceled).

31. (Currently amended) A method for making an intermetallic structure, comprising:

providing a plurality of stacked and registered laminae where at least one lamina of the plurality of stacked and registered laminae comprises at least a first metal layer and a second metal layer where the first and second metal layers have a relative thickness and collectively have a selected volume to provide an intermetallic metal after heat processing having a desired stoichiometric ratio of elements and a desired lamina thickness; and

heat processing the stacked and registered laminae to form a monolithic structure comprising an intermetallic.

32. (Original) The method according to claim 31where at least one of the plurality of stacked and registered laminae is a patterned intermetallic lamina.

Claim 33. (Canceled).

34. (Currently Amended) The method according to claim [[33]] 31 where the at least one lamina is patterned prior to heat processing.

35. (Original) The method according to claim 31where at least a first lamina of the plurality of stacked and registered laminae is a patterned intermetallic lamina, and where at least a second lamina of the plurality of stacked and registered laminae comprises at least a first metal layer and a second metal layer.

36. (Original) The method according to claim 35 where the second lamina is patterned prior to heat processing.

37. (Original) The method according to claim 31 where at least two adjacent lamina are connected by at least one post.

38. (Original) The method according to claim 31 further comprising operatively associating at least one catalyst with the structure.

39. (Currently amended) The method according to claim 32 where the intermetallic lamina is patterned using lithography, laser ablation, electrochemical patterning, chemical etching, plasma etching, mechanical cutting, hydraulic patterning, solid abrasion, particle beam, ultrasonic patterning[[;]], electromagnetic patterning, wire and ram electrodischarge (EDM) patterning, waterjet and abrasive waterjet, precision plasma cutting, and combinations thereof.

40. (Original) The method according to claim 32 where the intermetallic portion is a nickel aluminide.

41. (Original) The method according to claim 32 where the intermetallic portion is an iron aluminide.

42. (Original) The method according to claim 32 where the intermetallic portion is a titanium aluminide.

43. (Previously Presented) The method according to claim 31 where at least one of the lamina in the registered stack of laminae comprises a metal selected from aluminum, nickel, titanium, molybdenum, tantalum, copper, gold, silver, lead, tin, iron, antimony, magnesium, manganese, bismuth, germanium, tungsten, binary alloys thereof, binary intermetallics thereof, ternary alloys thereof, ternary intermetallics thereof, and combinations thereof.

44. (Original) The method according to claim 43 where the metal is a metal foil.

45. (Previously Presented) The method according to claim 31 where the stacked laminae comprise plural intermetallic foils.

46. (New) The method according to claim 31 further comprising ordering metal layers in a predetermined order selected to minimize voids during heat processing that result from Kirkendall porosities.

47. (New) A method for making a microfluidic device comprising an intermetallic, the method comprising:

providing a plurality of laminae where (1) at least one first lamina of the plurality of stacked and registered laminae comprises at least a first metal layer and a second metal layer where the first and second metal layers have a relative thickness and collectively have a selected volume to provide an intermetallic metal after heat processing having a desired stoichiometric

ratio of elements and a desired lamina thickness, and (2) at least one second lamina comprises a machined intermetallic lamina;

stacking and registering the at least one first lamina and the machined intermetallic lamina to form a registered stack; and

heat processing the stacked and registered laminae to form the microfluidic device comprising an intermetallic.